



THE ROLE OF PHYSIOTHERAPY IN THE MANAGEMENT OF LYMPHOMA PATIENTS: SYSTEMATIC REVIEW

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ABSTRACT

Patients diagnosed with lymphoma can experience many significant long-term effects, including fatigue and decreased QoL. This systematic review aims to investigate the published literature that discusses the role of physical therapy and exercise in the care of lymphoma patients. PubMed, Web of Science, Science Direct, EBSCO, and Cochrane library were searched. Study articles were screened by title and abstract using Rayyan QCRI then a full-text assessment was implemented. Fourteen studies were included, with a total of 2071 lymphoma patients. All the included studies demonstrated that exercise significantly improves the QoL of lymphoma survivors. The included studies reported that these programs improve the patient's mental health, improve average fatigue and overall quality of sleep, decrease limitations brought on by side effects such as peripheral neuropathy, and enhance patients' balance and mobility. We found that physical therapy and exercise dramatically improve the QoL of lymphoma survivors.

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Introduction

The global public health concern of cancer is significant. Lymphoma is one of the most prevalent cancer kinds [1]. Lymphomas are hematological malignancies that develop in the lymph nodes and immune system tissues of the body. They come in a variety of subtypes with different biological and clinical characteristics. Non-lymphoma Hodgkin's (NHL) and Hodgkin's lymphoma (HL) are the two primary subtypes (NHL). In recent decades, the development of monoclonal antibody therapy targeted against cell surface molecules expressed on the majority of NHL cells has played a significant role in the rapid improvement in lymphoma survival rates [2].

The number of cancer survivors has increased as a result of advancements in cancer detection and therapy. Patients with lymphoma are typically treated with chemotherapy, sometimes in conjunction with radiation therapy, which can have a number of serious long-term and late effects, such as fatigue, disturbed sleep, neuropathy, physical loss, chronic pain, depression, anxiety, and a decreased quality of life (QoL) [3, 4].

To help enhance QOL and physical function, physical therapy intervention has been promoted as a part of the multidisciplinary approach. It is difficult for rehabilitation professionals because the PT intervention mostly depends on the treatment regimen, accompanying problems, and influence on patients' function. A recent systematic review found that patients' fatigue, psychiatric symptoms, and QOL improved as a result of aerobic endurance training, sensorimotor training, and strength training [5].

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Numerous studies have demonstrated the benefits of physical activity in reducing the symptoms of several chronic conditions, including type II diabetes and obesity [6], as well as in some malignancies, including breast, ovarian, colon, and lung cancer [7-9]. However, because they have significant anemia and thrombocytopenia, lymphoma patients have always been prohibited from exercising. The impact of exercise on cancer patients has been the subject of numerous system reviews and meta-analyses. Rebecca *et al.* [10] analyzed 102 study articles in 2010, 90% were randomized controlled trials (RCTs), and 6% were lymphomas. Nearly 40% of the interventions have a duration of more than 3 months. During and after cancer treatment, they discovered slightly to moderately favorable impacts of physical activity on the improvement of life quality, physical activity levels, anxiety, and self-esteem.

Many previous studies suggested that exercise programs positively affect the QoL of lymphoma patients, including the patients' fatigue and psychomotor activities. This systematic review aims to study the published literature investigating the effect of physiotherapy and exercise in managing patients with lymphoma.

Materials and Methods

Preferred Reporting Items for Systematic Reviews and Meta-Analyses, (PRISMA) guidelines were used as the points of reference for the current review.

Study Design

The review was systematic.

Study Duration

The month of April through to May 2022.

Study Condition

This review investigates the effect of physiotherapy and exercise in the management of patients with lymphoma.

Search Strategy

PubMed, Science Direct, Cochrane Library, Web of Science, and EBSCO were thoroughly searched in order to identify the pertinent literature. Only English-based works were considered in the search which followed the specific requirements for each database. "Lymphoma," "Hodgkin lymphoma," "Non-Hodgkin lymphoma," "Hematological cancers," "Physical therapy," "Physiotherapy," "Exercise programs," and "Rehabilitation" were some of the Mesh terms that were keyed into the PubMed database to look for the right studies. Boolean operators like "OR" and "AND" were employed to filter the results. The search returned freely available studies, full-text English publications, and human trials.

Selection Criteria

Inclusion Criteria

The papers chosen were selected based on the following criteria; male or female patients with lymphoma who underwent exercise programs to improve their life quality.

Exclusion Criteria

Any publications that were not focused on the current research were omitted.

Data Extraction

Duplicate results were fished from the search strategy using the Rayyan (QCRI) [11]. By restricting the combined search results based on the inclusion/exclusion criteria, the researchers were able to determine the bearing of the titles and abstracts. The reviewers looked over the papers that met the inclusion criteria while discussing ways to resolve conflicts. The qualifying studies were added using a made-up data extraction form. The study titles, authors, study year, study designs, participant count, mean age, cancer type, length of exercise programs, program type, and primary outcomes were all retrieved by the authors.

Strategy for Data Synthesis

Summary tables created from the data gathered from the eligible studies were given a qualitative overview of the included research components and results. Once the data for the systematic review were extracted, the most effective method for utilizing the data from the included study articles was selected. Studies that did not show the influence of exercise regimens on lymphoma patients were ignored.

Results and Discussion

Search Results

Ninety-two duplicates were removed from the total of 780 study articles retrieved by the systematic search. After the title and abstract screening, only 200 articles passed and they were enquired about for retrieval, with only 9 articles not being recovered.

The full-text assessment was performed on the 191 studies whereby; 89 were dismissed for wrong study conclusions, 70 for unavailable data on the effect of physiotherapy on lymphoma patients, and 18 for the incorrect population type. This systematic review only included 14 appropriate studies. **Figure 1** represents a summary of the selection procedure.

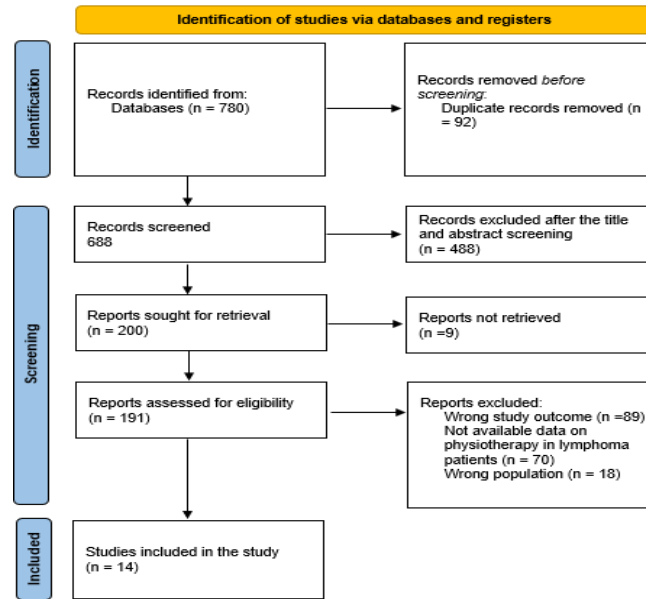


Figure 1. PRISMA flowchart summarizes the study selection process

Characteristics of the Included Studies

A total of 14 studies were included in this review, with 2071 patients with lymphoma who underwent various exercise programs. Eleven studies were RCTs [12-22], two were retrospective cohort studies [23, 24], and one was an observational study [25]. Physiotherapy and different exercise programs were applied to lymphoma patients. All the included studies demonstrated that exercise significantly improves the QoL of lymphoma survivors. Two studies reported that Self-directed exercise (SDE) improves the patients' mental health and their sense of emotional self-efficacy [14, 25]. Other studies found that physiotherapy decreases limitations brought on by side effects such as peripheral neuropathy, and enhances patients' balance, degree of physical performance, and mobility [15, 20, 21]. Chan-Chuang qigong exercise was found to improve average fatigue and overall quality of sleep [16, 17]. Vigorous exercise was linked to a dose-dependent reduction in the risk of CV events [23].

Table 1. A summary of characteristics of the included study articles.

Study	Country	Study designs	Participants (n)	Male (n)	Mean age	Duration of program (weeks)	Type of intervention	Key findings
Hathirani et al., 2021 [12]	United Kingdom	RCT	46	17	61 ± 16.7	12	Relaxation and exercise programs	Exercise or relaxation can considerably enhance QoL for lymphoma survivors.
Courneya et al., 2015 [13]	Canada	RCT	122	69	53.2	12	The Healthy Exercise for Lymphoma Patients (HELP) Trial	Increased progression-free survival in lymphoma patients may be related to supervised aerobic activity among lymphoma patients.
Vallerand et al., 2018 [14]	Canada	RCT	51	20	52.6 ± 13.7	12	SDE and basing telephone counselling exercise	Various mental health QoL scores showed clinically significant improvements. The program had a high level of approval from participants, demonstrating its broad acceptance among this group of cancer survivors.
Streckmann et al., 2014 [15]	Germany	RCT	56	42	19-73	NA	Physiotherapy as a common form of standardized clinical management	Cancer patients can benefit from exercise, especially sensorimotor training, which is a practical and promising approach. It enhances patients' quality of life, decreases limitations brought on by side effects as peripheral neuropathy, and enhances patients' balance, degree of physical performance, and mobility.

Yeh and Chung <i>et al.</i> , 2016 [16]	Taiwan	RCT	102	57	59.79 ± 16.54	3	Chan-Chuang qigong exercise lasting 20-min twice per day	The 21-day Chan-Chuang qigong exercise program dramatically improved average fatigue, worst fatigue, and overall sleep quality.
Chuang <i>et al.</i> , 2017 [17]	Taiwan	RCT	96	55	55.85 ± 16.78	3	Chan-Chuang qigong exercise lasting 20-min twice per day	The 21-day Chan-Chuang qigong program can substantially reduce tiredness intensity and interference and enhance white blood cell counts, hemoglobin levels, sleep quality, and QoL.
Furzer <i>et al.</i> , 2016 [18]	Australia	Prospective RCT	37	NA	48.9 ± 13.1	12	Customized exercise plan with advanced cardiovascular and resistance training	Following therapy, patients with hematological cancer benefited from this program in terms of extra outcomes and significant statistical and clinical improvements in cancer-related fatigue.
Van Dongen <i>et al.</i> , 2019 [19]	Netherlands	Prospective RCT	109	69	52 ± 11	18	The supervised high-intensity combined resistance and interval exercise program	This program had significant long-term positive effects on physical fitness and tiredness compared to standard care, but it was not a cost-effective intervention for society.
Courneya <i>et al.</i> , 2009 [20]	Canada	RCT	122	72	53.2	12	Supervised aerobic exercise training	Without impairing medical treatments or responses, aerobic exercise training significantly improved crucial patient-rated outcomes and objective physical functioning in lymphoma patients.
Fischetti <i>et al.</i> , 2019 [25]	Italy	Observational study	36	12	54.4 ± 19.1	8	combined aerobic, resistance and postural exercises on both the psychological and physical fitness	Exercise may lessen the perception of cancer-related fatigue, confirming its importance as a major preventive measure. It may also increase one's sense of emotional self-efficacy in controlling negative affect and expressing positive emotions.
Jones <i>et al.</i> , 2014 [23]	USA	Retrospective cohort study	1187	632	41.9		Vigorous intensity exercise	In survivors of HL, vigorous exercise was linked to a dose-dependent reduction in the risk of CV events, regardless of CV risk profile or treatment.
Cox <i>et al.</i> , 2021 [24]	Italy	Prospective cohort study	30	21	65.5 (median)	16	Exercise training	Exercise training is possible and safe during chemotherapy, even for patients over the age of 65. Additionally, it might enhance the delivery of care.
Gaser <i>et al.</i> , 2022 [21]	Germany	RCT	41	27	10.4 ± 4.0	3.5	Tailored exercise program	Exercise programs were successful in maintaining daily living activities and motor function during intensive therapy. In contrast, regular strength training interventions throughout therapy tend to be more advantageous in muscle explosive and endurance strength.
Zimmer <i>et al.</i> , 2014 [22]	Germany	RCT	36	27	62.23 ± 13.09	NA	exercising for 30 minutes at a moderate level on a bicycle ergometer	Exercise has the potential to alter cytokine levels, which could alter the epigenetic patterns of tumour-competitive lymphocytes.

This systematic review investigated the available published literature regarding the effect of physiotherapy and exercise in patients diagnosed with lymphoma with reference to the improvements in psychological status, QoL, physical performance, fatigue, and sleep quality. The review yielded 14 with variable methodological quality and sample sizes. These studies showed significant diversity in the inclusion criteria for diagnosis.

Our study reported that physiotherapy/ physical activity significantly improves the QoL of lymphoma survivors. Exercise's impact on health-related QoL in adult cancer survivors following treatment was examined by Mishra *et al.* [26] in 2012. The results of 40 randomized controlled or controlled trials involving 3694 cancer patients suggest that exercise may improve health-related QoL, although further research is necessary due to high variability. Additionally, the authors advise concentrating on a single cancer type in order to examine its biggest effects on QoL. In 2014, Bergenthal *et al.* [27] carried out a review that comprised 9 RCTs and 818 patients with hematological malignancies. They discovered no discernible difference in mortality between the exercise intervention and control groups.

While physical functions, weariness, and depression can all be improved via exercise, adverse events, physical performance, and anxiety cannot. In 2018, 4519 cancer survivors from 34 randomized exercise trials were aggregated by Buffart *et al.* [28]. They discovered that the best ways to improve QoL and muscle strength were to target particular subgroups with high levels of fatigue and poor levels of self-reported physical functioning. The lymphoma survivors, however, were the subject of few investigations. According to some studies, CRF cannot be eased by rest because of its putative connections to biochemical/inflammatory alterations or because it is defined by its subjective property [29].

Additionally, there are conflicting studies on the link between physical activity and improved life quality and cancer risk reduction. In a 12-week multi-center randomized controlled trial conducted by Elizabeth *et al.*, it was discovered that physical and psychosocial interventions had no impact on psychosocial function or health-related quality of life (HrQoL) in children with cancer, with the exception of parental reported pain and procedural anxiety [30].

We also found that these exercise programs positively affect mental health [14, 25], and decrease side effects such as peripheral neuropathy, and enhance patients' balance, degree of physical performance, and mobility [15, 20, 21].

Two studies [16, 17] used a mind-body practice called qigong employs both exercise and meditation to synchronize the body, mind, and spirit [31]. Qigong is an essential component of traditional Chinese medicine and is practiced regularly to avoid illness, enhance health, and increase vitality. Any age or physical condition can learn the qigong exercises, which include breathing, meditation, intention, and rhythmic movements [32]. These studies reported that Chan-Chuang qigong exercises dramatically improved average fatigue, worst fatigue, and overall sleep quality. Additionally, they enhance white blood cell counts and hemoglobin levels [16, 17].

According to a number of earlier research, qigong has therapeutic advantages for cancer patients, including the reduction of symptom severity and psychological anguish [33]. In addition to reducing fatigue, leucopenia, and depression, qigong also enhances mood, inflammation, and quality of life [21]. However, a comprehensive study by Lee *et al.* [31] found no evidence to support the usefulness of qigong in the treatment of cancer.

Conclusion

This systematic review reported that physical therapy and exercise dramatically improve the QoL of lymphoma survivors. We also found that these exercise programs positively affect mental health, average fatigue, overall quality of sleep, and decrease side effects such as peripheral neuropathy, and enhance patients' balance, degree of physical performance, and mobility.

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References

1. Viale PH. The American Cancer Society's facts & figures: 2020 edition. *J Adv Pract Oncol.* 2020;11(2):135.
2. DeVita Jr VT, Rosenberg SA, Lawrence TS. DeVita, Hellman, and Rosenberg's Cancer: Short Title. Lippincott Williams & Wilkins; 2022.
3. Herrlinger U, Schäfer N, Fimmers R, Griesinger F, Rauch M, Kirchen H, et al. Early whole brain radiotherapy in primary CNS lymphoma: negative impact on quality of life in the randomized G-PCNSL-SG1 trial. *J Cancer Res Clin Oncol.* 2017;143(9):1815-21.
4. Pachman DR, Barton DL, Swetz KM, Loprinzi CL. Troublesome symptoms in cancer survivors: fatigue, insomnia, neuropathy, and pain. *J Clin Oncol.* 2012;30(30):3687-96.
5. Amatya B, Fary KH, Dickinson M. Rehabilitation in patients with lymphoma: an overview of Systematic Reviews. *J Rehabil Med.* 2021;53(3).
6. Gill JM, Cooper AR. Physical activity and prevention of type 2 diabetes mellitus. *Sports Med.* 2008;38(10):807-24.
7. Wolin KY, Yan Y, Colditz GA, Lee IM. Physical activity and colon cancer prevention: a meta-analysis. *Br J Cancer.* 2009;100(4):611-6.
8. Olsen CM, Bain CJ, Jordan SJ, Nagle CM, Green AC, Whiteman DC, et al. Recreational physical activity and epithelial ovarian cancer: a case-control study, systematic review, and meta-analysis. *Cancer Epidemiol Biomarkers Prev.* 2007;16(11):2321-30.
9. Monninkhof EM, Elias SG, Vlems FA, van der Tweel I, Schuit AJ, Voskuil DW, et al. Physical activity and breast cancer: a systematic review. *Epidemiology.* 2007;137-57.
10. Speck RM, Courneya KS, Mâsse LC, Duval S, Schmitz KH. An update of controlled physical activity trials in cancer survivors: a systematic review and meta-analysis. *J Cancer Surviv.* 2010;4(2):87-100.

11. Ouzzani M, Hammady H, Fedorowicz Z, Elmagarmid A. Rayyan—a web and mobile app for systematic reviews. *Syst Rev.* 2016;5(1):1-0.
12. Hathiramani S, Pettengell R, Moir H, Younis A. Relaxation versus exercise for improved quality of life in lymphoma survivors—a randomised controlled trial. *J Cancer Surviv.* 2021;15(3):470-80.
13. Courneya KS, Friedenreich CM, Franco-Villalobos C, Crawford JJ, Chua N, Basi S, et al. Effects of supervised exercise on progression-free survival in lymphoma patients: an exploratory follow-up of the HELP Trial. *Cancer Causes Control.* 2015;26(2):269-76.
14. Vallerand JR, Rhodes RE, Walker GJ, Courneya KS. Feasibility and preliminary efficacy of an exercise telephone counseling intervention for hematologic cancer survivors: a phase II randomized controlled trial. *J Cancer Surviv.* 2018;12(3):357-70.
15. Streckmann F, Kneis S, Leifert JA, Baumann FT, Kleber M, Ihorst G, et al. Exercise program improves therapy-related side-effects and quality of life in lymphoma patients undergoing therapy. *Ann Oncol.* 2014;25(2):493-9.
16. Yeh ML, Chung YC. A randomized controlled trial of qigong on fatigue and sleep quality for non-Hodgkin's lymphoma patients undergoing chemotherapy. *Eur J Oncol Nurs.* 2016;23:81-6.
17. Chuang TY, Yeh ML, Chung YC. A nurse facilitated mind-body interactive exercise (Chan-Chuang qigong) improves the health status of non-Hodgkin lymphoma patients receiving chemotherapy: Randomised controlled trial. *Int J Nurs Stud.* 2017;69:25-33.
18. Furzer BJ, Ackland TR, Wallman KE, Petterson AS, Gordon SM, Wright KE, et al. A randomised controlled trial comparing the effects of a 12-week supervised exercise versus usual care on outcomes in haematological cancer patients. *Support Care Cancer.* 2016;24(4):1697-707.
19. van Dongen JM, Persoon S, Jongeneel G, Bosmans JE, Kersten MJ, Brug J, et al. Long-term effectiveness and cost-effectiveness of an 18-week supervised exercise program in patients treated with autologous stem cell transplantation: results from the EXIST study. *J Cancer Surviv.* 2019;13(4):558-69.
20. Courneya KS, Sellar CM, Stevinson C, McNeely ML, Peddle CJ, Friedenreich CM, et al. Randomized controlled trial of the effects of aerobic exercise on physical functioning and quality of life in lymphoma patients. *J Clin Oncol.* 2009;27(27):4605-12.
21. Gaser D, Peters C, Oberhoffer-Fritz R, Götte M, Feuchtinger T, Schmid I, et al. Effects of strength exercise interventions on activities of daily living, motor performance, and physical activity in children and adolescents with leukemia or non-Hodgkin lymphoma: Results from the randomized controlled ActiveADL Study. *Front Pediatr.* 2022;10.
22. Zimmer P, Baumann FT, Bloch W, Schenk A, Koliamitra C, Jensen P, et al. Impact of exercise on pro inflammatory cytokine levels and epigenetic modulations of tumor-competitive lymphocytes in Non-Hodgkin-Lymphoma patients-randomized controlled trial. *Eur J Haematol.* 2014;93(6):527-32.
23. Jones LW, Liu Q, Armstrong GT, Ness KK, Yasui Y, Devine K, et al. Exercise and risk of major cardiovascular events in adult survivors of childhood hodgkin lymphoma: a report from the childhood cancer survivor study. *J Clin Oncol.* 2014;32(32):3643.
24. Cox MC, Nusca SM, Di Landro F, Marsilli G, Stella G, Sigona M, et al. Exercise training (ET) in adult and elderly patients receiving anti-lymphoma treatments is feasible and may improve the provision of care. *Leuk Lymphoma.* 2021;62(3):560-70.
25. Fischetti F, Greco G, Cataldi S, Minoia C, Loseto G, Guarini A. Effects of physical exercise intervention on psychological and physical fitness in lymphoma patients. *Medicina.* 2019;55(7):379.
26. Mishra SI, Scherer RW, Snyder C, Geigle PM, Berlanstein DR, Topaloglu O. Exercise interventions on health-related quality of life for people with cancer during active treatment. *Cochrane Database Syst Rev.* 2012;(8).
27. Bergenthal N, Will A, Streckmann F, Wolkewitz KD, Monsef I, Engert A, et al. Aerobic physical exercise for adult patients with haematological malignancies. *Cochrane Database Syst Rev.* 2014;(11).
28. Buffart LM, Sweegers MG, May AM, Chinapaw MJ, van Vulpen JK, Newton RU, et al. Targeting exercise interventions to patients with cancer in need: an individual patient data meta-analysis. *J Natl Cancer Inst.* 2018;110(11):1190-200.
29. Saligan LN, Olson K, Filler K, Larkin D, Cramp F, Sriram Y, et al. The biology of cancer-related fatigue: a review of the literature. *Support Care Cancer.* 2015;23(8):2461-78.
30. van Dijk-Lokkart EM, Braam KI, van Dulmen-den Broeder E, Kaspers GJ, Takken T, Grootenhuis MA, et al. Effects of a combined physical and psychosocial intervention program for childhood cancer patients on quality of life and psychosocial functioning: results of the QLIM randomized clinical trial. *Psycho-Oncol.* 2016;25(7):815-22.
31. Lee MS, Chen K, Sancier KM, Ernst E. Qigong for cancer treatment: a systematic review of controlled clinical trials. *Acta Oncol.* 2007;46(6):717-22.
32. Lee MS, Lee MS, Choi ES, Chung HT. Effects of Qigong on blood pressure, blood pressure determinants and ventilatory function in middle-aged patients with essential hypertension. *Am J Chinese Med.* 2003;31(03):489-97.
33. Lee TI, Chen HH, Yeh ML. Effects of chan-chuang qigong on improving symptom and psychological distress in chemotherapy patients. *Am J Chinese Med.* 2006;34(01):37-46.